CLAIMS

1. Method for measuring interphase levels between fluids, characterised in that

a variable magnetic field is established in one of the fluids by means of a device creating a magnetic field, whereby a counter-flowing magnetic field is established, being a function of the properties of the fluid with respect to the portion of conductive fraction in the fluid, and the conductivity of the fraction;

and the properties of the mentioned fluid are registered by registering of the system's prominent impedance, alternatively a resonance frequency, and

by corresponding registration in different fluid layers at various height levels, and in the existing interphase layers, and thereafter mutual comparison of mentioned properties, one or more interphase levels that are present are determined.

2. Method in accordance with claims 1-2, characterised in that the magnetic field creating means comprises a coil which receives an alternating voltage, such as by means of an oscillator.

3. Method in accordance with claims 1-2, characterised in that a number of mutually separate coils (30a,30b,..,30h) are being used, arranged in a tube (32) of electrically insulating material, with said tube being arranged in the fluid mixture, the level ratio of which is to be registered, and the coils are connected one by one to an impedance analyser/detector electronics via a multiplexer, for further treatment of the measured data.

4. Method in accordance with one of the claims 2-3, characterised in that the resulting impedance/resonance frequency (17) is registered from the established counter-induced voltage (magnetic field), depending on which fluid (boundary layer) the respective coil is in contact with.

5. Method in accordance with one of the preceding claims characterised in using a connection is provides for excitation of the coil(s) at resonance including measurement of the coil(s) impedance, comprising:

a detector coil (20) comprising a capacitance C_1 connected in parallel with a coil L_1, an amplifier (26) which is retro-connected to the coil L_s and capacitance C_1, and the coil (20) is connected to a phase detector (22), which in turn is connected to an integrator (24) and further to a voltage oscillator VCO,

and said oscillator VCO being connected to the retro-connection circuit via a resistance R_o, and connected directly to the phase detector (22),

such that excitation of the coil is ensured at resonance, and the coil impedance and resonance frequency can be measured, as the impedance is pure resistance at resonance.

6. Method in accordance with one of the preceding claims, characterised in that measurements are carried out at frequencies up to 20 MHz, particularly in the range 5-15 MHz.

7. Method in accordance with claim 3, characterised in that the coil resonance frequency

$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

for the different fluid phases is measured, with L being the coil inductance and C the resulting capacitance between the windings.

8. Device for measuring interphase levels between fluids, characterised by one or more means for establishing magnetic field is/are arranged in order to establish a variable magnetic field in the fluids, and

means for registering (17) of the impedance/resonance frequency resulting from the counterinduced voltage

(magnetic field) formed, which depends on which fluid (boundary layer) the respective magnetic field establishing means is in contact with.

9. Device in accordance with claim 8, characterised in that the magnetic field forming means comprises a coil which can receive an alternating voltage, such as by means of an oscillator.

10. Device in accordance with claim 9, characterised in that a number of coils (30a,30b,…,30h) are arranged inside a tube of electrically insulating material, with the coil connections being fed to a junction unit which is arranged to connect the coils to the detector electronics one by one, such as an impedance analyser, and the measuring signal from the detector electronics is sent further for interpretation, presentation, information and regulation.

11. Device in accordance with claim 10, characterised by a detector connection comprising:

a detector coil (20) comprising a capacitance C_1 connected in parallel with a coil L_1, an amplifier (26) which is retro-connected to the coil L_s and the capacitance C_1, and the coil (20) is connected to a phase detector (22), which in turn is connected to an integrator (24) and further to a voltage oscillator VCO,

said oscillator VCO being connected to the retro-connection circuit via a resistor R_o, and connected directly to the phase detector (22).

12. Method for measuring concentrations/parts of a conductive fraction in flowing multiphase mixtures, characterised in that

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an excitation coil (40) and a detector coil (42) are arranged enclosingly around a body, such as a tube (44), which carries the multiphase volume; the excitation coil (40) is applied an alternating voltage, and the resulting detector voltage registered in the detector coil (44) is compared to calibration values of the system to determine

the part of conductive fractions in the multiphase flow/volume.

13. Method for measuring concentrations/parts of a conductive fraction in flowing multiphase mixtures, characterised in that

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the parameters in the form of the conductivity of the conducting fraction, size distribution of droplets in the fluid mixture and conductive fractions are measured by application of two excitation coils (55, 57) with respective mutually different resonance frequencies f_1 and f_2, and a detector coil (56), and the induced voltage in the detector coil (56), which is the sum of the induced voltage from the magnetic fields from the two excitation coils (55, 57), and comprising two frequencies, is applied to estimate the independent parameters, such as by means of mathematical models or neural networks.

14. Method in accordance with claims 12-13, characterised in that the method is applied to a flowing mixture of oil, water and gas, where the water is electrically conductive, while the gas and the oil are not conductive.

15. Device for measuring concentrations/parts of a first fluid in a second fluid in multiphase mixtures, or in flows of the fluids, characterised in that

an excitation coil and a detector coil are arranged enclosingly round the volume (such as a pipe which carries the multiphase fluid), in that the excitation coil is arranged to be applied an alternating voltage, and a resulting detector voltage is arranged to be registered, and the detector voltage is compared to calibration values of the system to determine the portion of conductive fraction in the multiphase stream/volume.

16. Device for measuring concentrations/parts of a first fluid in a second fluid in multiphase mixtures, or in flows of the fluids, characterised in that

~~two excitation coils (55, 57) which, via excitation oscillators (62, 64) respectively, are arranged to be driven by mutually different resonance frequencies f_1 and f_2 respectively; and a detector coil (56) connected to a voltage detector, with the excitation coils (55, 57) and the detector coil (56) being arranged enclsoingly around the volume (such as a tube that carries the multiphase fluid forward).~~

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~~17. Device in accordance with claim 16, characterised in that the detector coil (56) is arranged between the two excitation coils (50, 52), and that the unit of the three coils (50, 52, 56) is mounted inside a coat (58), typically made from steel, and the unit surrounds the means (tube/duct) through which the fluid is flowing.~~

18. Application of
1) device and method according to claims 1-11 for determination of interphase layers during separation of oil, gas and water phases; and of
2) methods and devices according to claims 12-17 for determination of the part of water in multiphase mixtures of oil, gas and water and solid particles (sand).

19. Application in accordance with claim 18 for measuring/registering of interphase layers which comprise an oil-continuous layer with a droplet size distribution of water in the oil, and a water-continuous layer with a droplet size distribution of oil in the water, and where the boundary layer between the oil phase and the gas phase comprises a foam layer.